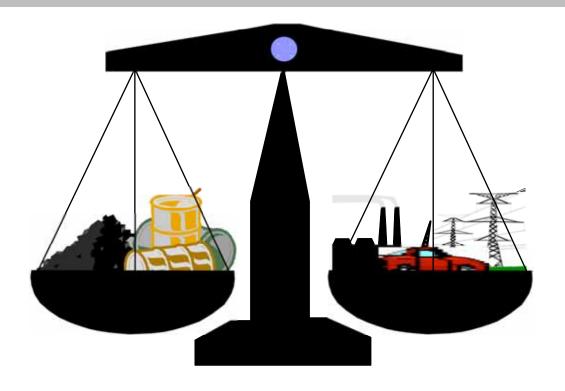
California Energy Balances (CALEB)





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Goals of the CALEB Project



- Provide a complete picture of energy use in California at the most detail level possible in term of end use consumption
- Centralize energy data on supply and demand for the State of California
- "Reconcile" different sources of data (EIA, CEC, Utilities, Surveys, Independent reporting, etc)
- Serve as a statistic resource for energy analysts and for the construction of GHG inventory
- Provide analytical tool for tracking trends in California energy use and GHG emissions (e.g. energy/emissions indicators and decomposition analysis)

Progress to Date



Phase I:

- Construction of Energy Balances in Access software from 1990 to 2004 that include data for 34 energy products disaggregated across 130 different consumption categories.
- Report documenting the methodology, data sources, and the trends of energy supply and use in California over the period 1990 to 2004.

Development of Energy Balances for the State of California, publication number CEC-500-2005-068, published June 2005, authors: Scott Murtishaw, Lynn Price, Stephane de la Rue du Can, Eric Masanet, and, Jayant Sathaye

Phase II:

- Preliminary indicators database for the building sector
- Report on residential and service sector energy indicators

Energy Consumption in California's Buildings Since 1990: An Indicators Assessment of Key Factors. publication number CEC-500-2007-077., published July 2007, Author: Scott Murtishaw.

Energy Balance



Data Source

Main Source:

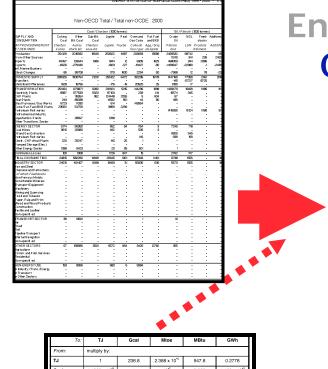
EIA and CEC Questionnaires & Surveys

Others Source:

API
USGS
Highway
Statistics

Asphalt Institute, etc

Energy Statistics Physical units



Conversion factors

Energy Balance Common unit

					ENERGY	BALANCE	S OF OE	CD COUN	TRIES, 19	097-199	3 - IL1
		OE	CD To	tal / O	CDE To	tal : 19	98				
		Million tonne	es of oil equ	ivalect / 14	Noo de tons	ns a'élquival	ecr.pérole				
SUPPLY AND CONSUMPTION	Coal		Products Products	Gas	Nuclear	Hydro	Geothern. Solar esc.	Contrast Renew 6 Waste	Bactricity	Haat	Total
APPROVISIONNEMENT ET DEMANDE	Charbon	Pétrale orur	Produits persiens	Gaz	Nucléaire	Hydro	Géotherm sonare étc.	En ren consust a decheta	Electricate	Chaleur	Total
Indigenous Production	1005.64	1046.06		874.91	553.59	111.08	30.05	168.64		0.35	37903
moors	259.97	1594.37	380.85	345.32				0.45	23.99	0.00	25/4/
Exports ES, ISSON BURNES	-213.37	-430.86	-322.03	-159.46	- 1		- 1	-0.00	-23.18	-0.00	-1154.5
Stock Unanges	-0.39	13.44	-1031	-13.08				9339			-99.1
TPES	1046.95	2170.13	-32.78	1047.69	553.53	111.08	30.06	160.11	0.81	0.36	5066.5
Transfera		-28.22	29.41					-0.10			1.0
SERVICE LATERATURE	21.99	46.00	201	-0.056				49.12			12.0
Electrony Harris CHP Harris	-735.43	-9.72	-122/39	185.21	-008.00	-111,08	27.56	1927	702.80 70.10	35.40	-10563
CHP Maris Heat Maris	-6.42	-0.77	-1.07	4.77	-0.04		-0.43 -0.37	44.25	75.95 -0.42	13.82	42
SAR WORKS	-6.79		-2.10	3.36			-		-	-	-90.0
Peticieum Hen nenes Coal Ligoratumation	191.79	-2150.86	2168.22	023		- 1		-0.96			-718
Liquetaction	-00.19		10.00	10.23				10.10		- :	-71.0
Other I range emission		20.72	-900.100	47.66				-9305			-0.8
CWn Use	-1285	-1.00	-129/95 -0.14	-89.41			40.08	-0.03	463.686	422	-300.3
Distribution Losses TPC	132.75	241	1856.35	2.96			1.62	-0.00	-51.52	45.11	3466.9
	109.57									12.00	
INDUSTRY SECTOR	109.57	2.43	235.40 7.71	275.30			0.42	43.95	291.61	0.28	1041.6
Chemical and Petrochemical	7.57	2.43	215.47	96.21	- 3	- 1		1.08	48.13	4.47	575.3
of which: Feedstocks		2.27	195.01	21.24				-		-	219.5
Non-Herrous Metals	2.90		5.025	12.50				9.11	20.02	0.12	45.1
Non-Metatic Minerals Transport Equipment	25.50	- 1	19.78	28.57		- 1	- 1	0.73	13.49	0.10	20.4
	1.39		0.366	18.80			- 1	9.01	10.10	0.34	240.1
Mining and Usarrying	0.99		535.6	3.38				9.00	8.86	0.07	18.6
Poor and Tobacco	6.46 6.11		12.63	27.43	- 1		- 1	4.57 21.83	18.01	1.36	56.8
MODE WITH MODE PRODUCES	10.00	- :	2.81	110		- :		12.19	410	9.10	275.2
Construction	1.87		10.77	9.71				9.01	1.24	0.03	14.1
Textle and Leather Non-specified	U.75 T.05		8323 29.09	7.51			0.42	0.10	9.852	0.43 4.37	24.5 97.4
										4.50	
TRANSPORT SECTOR FREETINGORY CINE AVEROR	0.10		1134.52	20.92				1.75	9.13		1166.4
Domestic Air Transport	- :		86.22	- :	- :	- :	- :	- :	- :	- 1	85.3
Hoad			942.09	0.54				1.75			944.3
Rail Hoeine i ransport	0.01		15.42	252.289					7.54		24.0
Pipeline I sansport Eterna Newseton	0.09	- 1	50.06	60.00		- 1	- :	- 1	V.66	- 1	20.6
Non-specifi ed			2.59	0.02					1.06	-	3.6
OTHER SECTORS	22.12		263,44	359.34			1.20	53.95	292.75	22.13	1124.5
Agriculture	1.89		10.80	3.10			9.00	0.84	9.60	0.29	703
Comm. and Publ. Services Haradaman	3.35		74,09	1113S2 240 HA			0.05	1.89	181.17	7.24	379.1 660.1
Non-specified	0.80		3.37	12.02			0.01	1.72	1.74	21.75	22.5
NON-ENERGY LISE	0.95		122.01	-			-			-	199.0
In Industry Francis to Design	0.77	- 1	112/07	- 1		- 1	- :	- 1	- :	- 1	1133
in I ransport in Other Sectors	0.18		7.85 2.73	:		:		:		:	7.8
Electricity Generated - GWh	3535175		660661	1280305	2124071	1291618	49477	142536			905607
Electricity Plants	2145059	- 1	580067	911977	2124071	1221515	49954	75656	- 1	- 1	817381
CHP places	262446		78604	374378			817	66928			88314
					1998		21125	375256	13455	22511	
Heat Generated - TJ	910000		197120	545482							
	702118 215480	- 1	197120 121221 65889	533902 111580	1550	- :	5985 15340	232052	2174	5284 22229	161530 58800

California Energy Balance 2000



Primary & Secondary products

ГВtu	Nat Gas	NGL	Crude &	Petro	Coal	Nuclear	Hydro	Other	Biomass	Electricity	Total
			Additives	Prods				Ren			i
Energy Supply	2,252	32	3,965	-589	136	364	134	434	30	247	7,09
Indigenous Production	337	32	1,795	- 0	- 11	364	134	-434	83	- 0	3,20
Import	1,885	- 10	2,224	479	-133	0		- 0	- 5	247	4,96
Export	-37.	0	-39	+782	0		0.	1.00	. 0	0	-35
Marine Bunkers	0.1	12	- 8	4242	44	0.	- 0		- 0	- 4	-24
Net Stock Withdrawal	47	-0	15	- 5	- 1	- 6	- 0	- 8	- 0	- 0	2

Transformation Sector	-978	-15	-3,969	4,978	-24	364	-134	-434	-91	:710	-1,239
Electric Sector	-942	0		-50	-24	-364	-134	-434	-85	210	+1,322
CHP, Commercial Power	-13	0.	.0	.0	0	0.	0.	. 0	0.		-1
CHP, Electric Power	-151	0.	0	-10	-21	U	0.	44	Ü.	29	-103
CHP, Industrial Power	790	- 0	0	-24	-3	n	0	0.0	0	- 57	-61
Electric Generators, Utilities	+130	0.5	- 0	42	0.	(364)	-130	.0)	0	292	-332
Electric Generators, IPP	-55R	- 0		-14	0.0	U	-4	.0	0	200	-377
Non-specified (Elec. Generation)	0	-fi	.0	.0	0	n	0.	-434	-85	77	-442
Oil Refineries	-36	-15	-3,969	4.128	0.	.0.	0		-6	- 0	103
Energy Sector	-390	- 0	.0	-312	0.	.0.	0.		0	-34	-236
Power Plants' Own Use	0	0.5	- 0	.01	(1)	701	0	1.67	AY.	- 91	
Oil Refineries' Own Use	-106	0.7	- 0	-311	0.	0.	100	0	0	-21	-437
Oil and Gas Extraction	-2X5	11	- 0	-11	0	- 0	100	11	- 0	-13	-299
Distribution Losses	0.	п	-0	- 0	я	ij.	0.	- 0	0	-77	-27
End Use Sector Consumption	1,110	12	- 0	3,119	46	Ü	0	. 0	U	863	5,152
Agriculture	111111111111111111111111111111111111111	11	. 0	- 65	17	n.	0.7	0	10		104
Mining	No.	16	.0	.0	0.	0.	0.	1.00	0	0	1

Electricity Output in GWh	103,236	- # -		5.527	2,364	35,176	39,272	36,341	6,184	- 0	205,10
CHP, Commercial Power (GWh)	1,710	.0	.0	11	.0.	.01	and the same	11/10/11	.0	.0	11,120
CHP, Electric Power (GWh)	20,180	0 -	0.0	3161	1,902	0	0	. 0	0		23,05
CHP, Industrial Power (GWh)	12,992	U	. 0	3,095	463	0		22	0	.0	16,57
Electric Generators, Utilities (GWh)	12.412	.01	.0	145	10	33,176	37,990	0	0	0	85,71
Electric Generators, IPP (GWh)	35,934	0	- 0	1,125	0.0	0	1,264	10	0	0	58,54
Non-specified (Elec. Generation, GWh)	. 0	- 0					- 0	10,319	6.184	- 0	22.50

Supply side

- Production
- Imports Exports
- Bunkers & Stock Change

Demand side

- Transformation & Energy

 Utilities, IPP, Refineries, oil and gas extraction.
- Final Consumption

 Industry, Transport, Agriculture,
 Residential, Commercial and
 Public Services)

Electricity Output

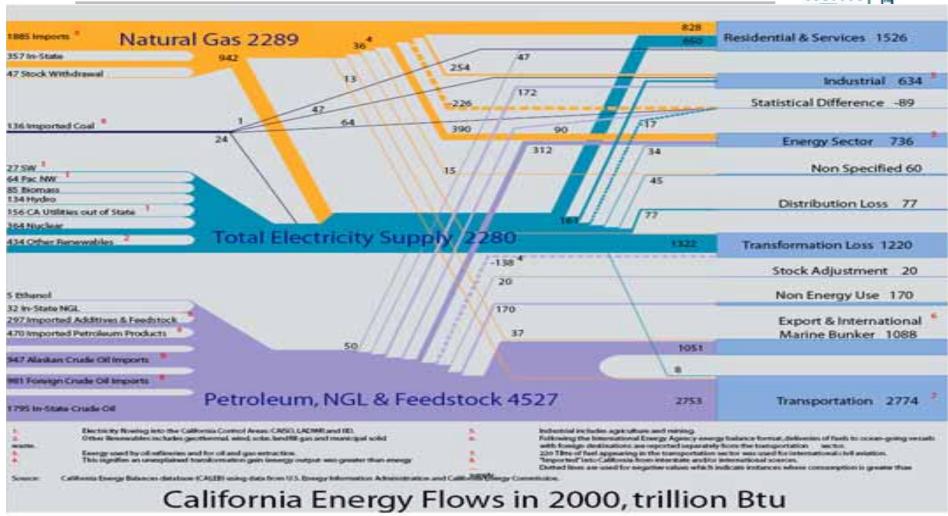
Manufacturing Sector

Non-specified (Other Sector) Non-Energy Use

Transport Sector Services Residential

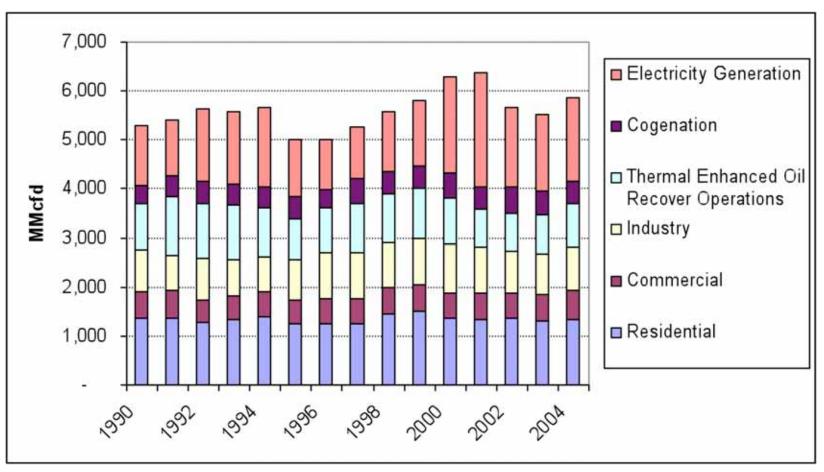
California Energy Flow



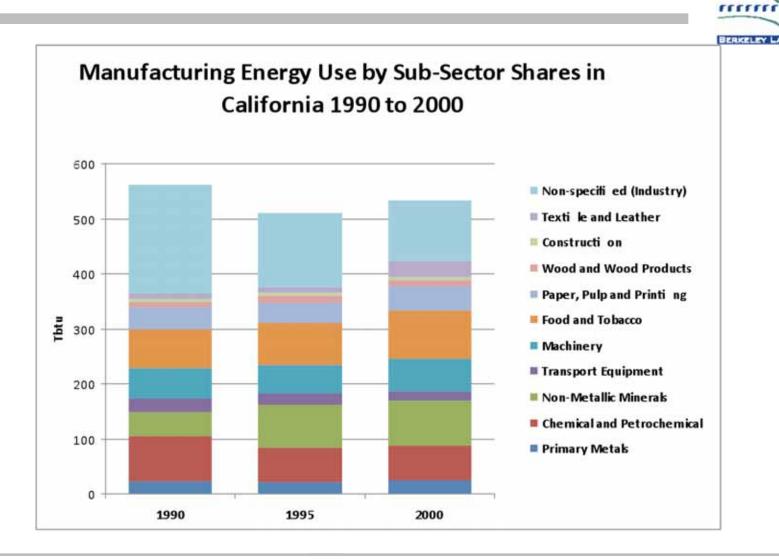


Trend Analysis: Natural Gas Consumption

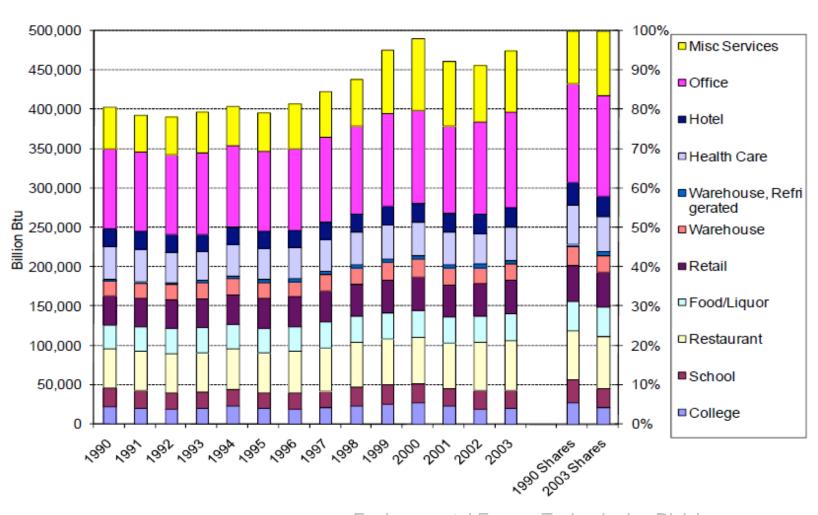




Example of Sectoral Detail: Industry



Example of Sectoral Detail: Services



recerre

BERKELEY

Energy Indicators



Indicator analysis match energy use with activity data to look at trend in energy intensity and structural changes at end use or sub sectoral level.

Example of indicators:

- •space heating residential energy use per square foot in residential home,
- •gasoline consumption per vehicle km for cars,
- •diesel consumption per ton km for freight trucks, etc

Shortcomings Encountered



Petroleum Products:

- Data on import/export to other states is difficult to gather
- Data on consumption is scarce for some fuel (LPG, residual fuel, Distillate Fuel Oil, solvents, etc..)
- Disaggregating petroleum products used for electricity generation,

CHP:

- Energy use by CHP for production of electricity versus heat.
- Estimating fuel used for CHP heat for previous to 1998,
- Add imported/exported electricity
- make improvements in coordination with the California Air Resource Board GHG inventory working staff

Phase Next Steps



- Update CA energy balance up to 2007 or 2008 depending on data availability
- ➤ Make improvements to the data set in coordination with the California Air Resource Board GHG inventory working staff
- > Reconcile different sources of data
- ➤ Supplement the energy database with Activity Data (GDP, sectoral value added, floor area, households, etc.)
- Construct indicators to analyze past energy trends in the building and industrial sectors